

1917/18

# NORTHEASTERN COLLEGE

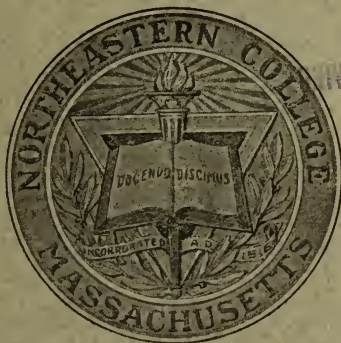
January 1917

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CATALOG

*of the*

## Evening School of Engineering



1917 - 1918

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*Published by*

*The* TRUSTEES of NORTHEASTERN COLLEGE

Boston Young Men's Christian Association

Number 316 Huntington Avenue, Boston, Massachusetts

# **NORTHEASTERN COLLEGE**

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## **SCHOOL OF LAW**

*Evening Sessions Only*

Established in 1898; incorporated in 1904. Provides a four years' course in preparation for the Bar, and grants the Degree of Bachelor of Laws.

## **SCHOOL OF COMMERCE AND FINANCE**

*Evening Sessions*

Established in 1907; incorporated in 1911. Offers the following four-year courses leading to the degree of B. C. S. (Bachelor of Commercial Science): Banking, Business Administration, Finance and Bond Salesmanship, and Professional Accountancy. Anyone passing the examination for advanced standing is enabled to complete any one of the four regular courses and secure the degree in three years. Special courses in addition to regular courses.

## **CO-OPERATIVE SCHOOL OF ENGINEERING**

*Day Sessions*

Four-year courses in Chemical, Mechanical, Electrical, and Civil Engineering, in co-operation with business firms. Students earn while learning. Open to High School graduates.

## **EVENING SCHOOL OF ENGINEERING**

*Evening Sessions*

A school offering three- and four-year courses in Chemistry, Chemical, Electrical, Structural, Railroad and Mechanical Engineering.

## **SCHOOL OF LIBERAL ARTS**

*Evening Sessions*

Beginning with the fall of 1916, courses of college grade in English, Mathematics, Science, History, and Education will be offered. Professors and instructors of New England colleges will be engaged. These courses are open to graduates of high schools and to others who can meet the entrance requirements.

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*For further information concerning any of the above schools or departments, address*

**NORTHEASTERN COLLEGE**

**316 Huntington Avenue, Boston, Massachusetts**

# NORTHEASTERN COLLEGE

January

1917

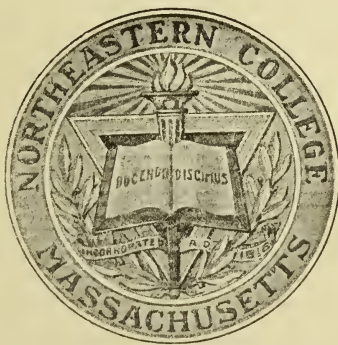
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# Calendar 1917-1918

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SEPTEMBER 18-21  
REGISTRATION

SEPTEMBER 24  
OPENING OF FIRST TERM

OCTOBER 12  
COLUMBUS DAY  
HOLIDAY

NOVEMBER 29  
THANKSGIVING DAY  
HOLIDAY

DECEMBER 19-25  
CHRISTMAS RECESS

DECEMBER 31  
BEGINNING OF SECOND TERM

JANUARY 1  
NEW YEAR'S DAY

FEBRUARY 22  
WASHINGTON'S BIRTHDAY  
HOLIDAY

APRIL 13  
CLOSE OF SCHOOL

# Index

	PAGE
CALENDAR .. .. .	2
INDEX .. .. .	3
OFFICERS OF GOVERNMENT .. .. .	4
OFFICERS OF ADMINISTRATION .. .. .	5
STAFF OF INSTRUCTION .. .. .	6-7
GENERAL INFORMATION :	
Four-Year Engineering Courses .. .. .	9
Special Non-Engineering Courses .. .. .	9
Requirements for Admission .. .. .	10
Tuition Fees .. .. .	10
Laboratory Fees .. .. .	11
Transfers .. .. .	11
Reports of Standing .. .. .	11
Physical Training .. .. .	12
Positions Held by Graduates .. .. .	12
Scholarships .. .. .	12
Diplomas and Certificates .. .. .	12
CIVIL ENGINEERING COURSE .. .. .	14-15
MECHANICAL ENGINEERING COURSE .. .. .	16-17
STRUCTURAL ENGINEERING COURSE .. .. .	18-19
ELECTRICAL ENGINEERING COURSE .. .. .	20-21
CHEMICAL ENGINEERING COURSE .. .. .	22-23
SUBJECTS FOR INSTRUCTION .. .. .	24
SYNOPSIS OF SUBJECTS .. .. .	25-36
SPECIAL COURSES .. .. .	36-39
EQUIPMENT .. .. .	40-44
SCHEDULE OF CLASSES .. .. .	45-46
RATES OF TUITION .. .. .	47



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## *EVENING SCHOOL OF ENGINEERING*

### **THE NEW NAME** **Northeastern College**

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For many years the terms Evening Law School, School of Commerce and Finance, and Co-operative School of Engineering, have been applied to the corresponding schools of the Department of Education. These names, however, were not distinctive, and both graduates and students requested that a regular title be given the schools doing work of college grade. As a result of their activities, the schools concerned were very thoroughly investigated by outside educational experts, to see if the scope and grade of work done would properly measure up to that of the recognized colleges and technical schools. Such was found to be the case in all the schools, and upon the submission of the various reports by the Educational Committee to the Board of Directors of the Association, the latter Board voted to apply the name "Northeastern College" to the group of schools comprising the following:

SCHOOL OF LAW

SCHOOL OF COMMERCE AND FINANCE

CO-OPERATIVE SCHOOL OF ENGINEERING

EVENING SCHOOL OF ENGINEERING

SCHOOL OF LIBERAL ARTS

These schools will henceforth be known as the regular schools of Northeastern College, of the Boston Young Men's Christian Association, and the College has been incorporated under Massachusetts law.

## GENERAL INFORMATION

### GENERAL INFORMATION

Many men in various lines of industry feel the need of special instruction in Engineering, either to advance in their normal occupation, or to enable them to change their positions and get into work of an Engineering nature.

To such men the Evening School of Engineering offers a wide variety of regular Engineering Courses, and in addition, special instruction for those who desire it, in Architecture, Drawing and Design. The Engineering Courses require attendance from two to three evenings a week, during a period of from three to five years, and, while only the fundamental subjects are taken up, the courses compare very favorably with similar courses offered by the good technical schools of the country.

#### Four-year Engineering Courses

Regular four-year courses, leading to a diploma, are offered in the following branches of Engineering:

- I Civil Engineering
- II Mechanical Engineering
- III Structural Engineering
- IV Electrical Engineering
- \*V Chemistry

\*There is a fifth elective year in the Chemistry Course for those desiring special instruction of an industrial and engineering nature.

These courses will be found outlined on succeeding pages (see Index) and the subjects of which they are comprised will be found described in detail under the heading "Subjects for Instruction" (see Index).

#### Special Non-Engineering Courses

Special courses in Architecture, Freehand and Mechanical Drawing and Industrial Design, are offered by the School, and will be found described in detail in the latter part of this catalog. (See Index.)

## *EVENING SCHOOL OF ENGINEERING*

### **Requirements for Admission**

The work carried on in the Engineering Courses assumes that the entering student has had previous training in Elementary Algebra, Plane Geometry and has a good ground-work in English. Practically, an entering student should have completed at least from one to two years' work in a good high school. Those who have completed a full high school course should be excellently fitted to carry on the courses and should derive the maximum benefit from the work.

Those men who finished grammar school, but who have not had the requisite previous training in Mathematics and English, can attend the Evening Courses of the Northeastern Preparatory School, and should be able to get the necessary preparation for entrance to the Engineering School in one year.

There are no entrance examinations for entering students, but each applicant for admission is required to have an interview with the Dean.

The Dean will ascertain the qualifications of each applicant, and advise him as to just what work he is qualified to undertake. The student then enrolls in the proper classes and his advancement is entirely dependent on the ability that he displays in the accomplishment of the prescribed work in his various subjects.

Should a student prove to be unable to handle any of his studies successfully, he may be required to discontinue that subject, and complete such preparatory work as is deemed necessary, before being re-admitted to the subject in question.

### **Tuition Fees**

For all regular courses the tuition fees are as follows:

The first year tuition in the full Engineering Course is thirty-five (35) dollars.

This amount, which includes membership in the Association, is payable as follows:

- \$15.00 upon entering the School
- 10.00 November 15th
- 10.00 January 15th

## GENERAL INFORMATION

The tuition fee for all years, except the first, is fifty dollars, which includes membership in the Association. This amount is payable as follows:

\$20.00 upon entering the School  
15.00 November 15th  
15.00 January 15th

Students who discontinue a course, but who have attended four or more recitations in the subject, will be required to pay a term's tuition.

The tuition fees for the Special Courses will be found toward the back of the catalog. (See Index.)

### Laboratory Fees

All students taking courses in the Chemical Laboratories are charged a laboratory fee of four dollars. This fee is payable in advance, and does not cover breakage, or destruction of apparatus.

A laboratory deposit of four dollars must be made before a desk will be assigned to a student. At the close of the school year the cost of equipment broken, or used up, by the student, will be deducted from this amount and the balance refunded. Students failing to check up their desks upon leaving school shall be charged one dollar extra.

### Transfers

No student is permitted to transfer from one course to another without consulting the Dean beforehand and receiving a transfer order, which must be presented at the main office for the proper ticket.

### Reports of Standing

Informal reports of the students' standing are issued twice during the school year, and formal reports, covering the year's work, are issued at the close of each year.

## *EVENING SCHOOL OF ENGINEERING*

### **Physical Training**

By a special arrangement between the Department of Recreation and Health and the School, it has been made possible for those students who desire it to get the privileges of the gymnasium and natatorium, for special hours, upon the payment of seven dollars and a half, in addition to the tuition. By this means our students may avail themselves of these privileges at a minimum cost.

### **Positions Held by Graduates**

The graduates of the School are in constant demand, and it may safely be said that those who complete one of the courses successfully can be sure of desirable employment in his chosen line.

Naturally the School cannot, and does not, guarantee to place its graduates in positions, but our experience has been that we have not been able to find men for all the positions we have been asked to fill.

### **Special Students**

Any of the subjects taught in the School may be taken singly, provided the head of the department concerned is satisfied that the student can pursue the work to advantage.

Those desiring to take such special work should consult the Dean, who will advise as to the steps to be taken.

### **Scholarships**

As an aid to worthy men who desire an education and are unable to pay in full even our slight charges, a limited number of scholarships has been provided, which will be judiciously distributed by the Board of Governors, to whom application should be made.

### **Diplomas and Certificates**

Upon the satisfactory completion of any of the regular courses, the student is entitled to receive a diploma. The



## *GENERAL INFORMATION*

satisfactory completion of one or more subjects entitles the student to receive a certificate stating the credits he has received. No certificates will be given, however, unless the student has successfully performed the prescribed work and passed the necessary examinations.

### **Suburban Members**

All tickets held by members of the Cambridge, Chelsea, Everett, Lynn, Malden, Melrose, Newton, Quincy, Salem, and Somerville Associations will be honored for membership in the Boston Association.

## *EVENING SCHOOL OF ENGINEERING*

### **CIVIL ENGINEERING**

The purpose of this course is to give the student an education in those subjects which form the basis of all branches of technical education, and a special training in those subjects comprised under the term "Civil Engineering." It is designed to give the student sound training, both theoretical and practical, in the sciences upon which professional practice is based.

Civil Engineering covers such a broad field that no one can become expert in its whole extent. It includes Topographical Engineering, Municipal Engineering, and Railroad Engineering. It covers land surveying, the building of railroads, harbors, docks and similar structures; the construction of sewers, waterworks, roads and streets. All of these branches of Engineering rest, however, upon a relatively compact body of principles, and in these principles the students are trained by practice in the class room, drawing room and the field.

The course is designed to prepare the young engineer to take up the work of assisting in the location and construction of steam and electric railways, sewerage and water supply systems.

# COURSE I

## CIVIL ENGINEERING

---

### First Year

	SUBJECT NUMBER
Mathematics I . . . . .	10
Practical Physics . . . . .	20
Mechanical Drawing . . . . .	40

### Second Year

Mathematics II . . . . .	11
Surveying and Plotting . . . . .	50
Topographical Drawing . . . . .	54
Highway Engineering . . . . .	56

### Third Year

*Structural Mechanics . . . . .	32
**Advanced Surveying . . . . .	51
Railroad Engineering . . . . .	57
Railroad Engineering Drawing . . . . .	58

### Fourth Year

*Railroad Engineering and Railroad Design . . . . .	59
**Municipal Engineering . . . . .	55
*Foundations . . . . .	82
**Materials of Construction . . . . .	81
Hydraulic Engineering . . . . .	112

\*First term.

\*\*Second term.

## *EVENING SCHOOL OF ENGINEERING*

### **MECHANICAL ENGINEERING**

This course is designed to give a foundation in those fundamental subjects which form the basis for all professional engineering practice, and to especially equip the young engineer with a knowledge of the various phases of Mechanical Engineering. The course embraces instruction by text-book, lecture, and drawing room.

The course affords training in the methods, and gives practice in the process of Construction, which develops in the student the capacity for thinking along mechanical lines, thus enabling him to base all of his work upon fundamental principles already learned, rather than upon empirical rules. It is the endeavor to give the student a good theoretical training and meanwhile devote sufficient time to the practical work, so that he may become a proficient engineer, both in theory and in practice in the various branches of Mechanical Engineering.

# COURSE II

## MECHANICAL ENGINEERING

---

### First Year

	SUBJECT NUMBER
Mathematics I . . . . .	10
Practical Physics . . . . .	20
Mechanical Drawing . . . . .	40

### Second Year

Mathematics II . . . . .	11
Mechanism . . . . .	90
Mechanical Engineering Drawing . . . . .	91
Machine Drawing . . . . .	92

### Third Year

Applied Mechanics I . . . . .	30
Thermodynamics . . . . .	95
Hydraulic Engineering . . . . .	112
*Foundations . . . . .	82
**Materials of Construction . . . . .	81

\*First term.

\*\*Second term.

### Fourth Year

(Omitted in 1917-1918)

Boilers and Prime Movers . . . . .	95A
Power Plant Design . . . . .	96
Concrete Construction . . . . .	80

## *EVENING SCHOOL OF ENGINEERING*

### **STRUCTURAL ENGINEERING**

The purpose of this course is to give the student a special training in those subjects comprised under the term "Structural Engineering." It is designed to give the student sound and thorough training in the science upon which professional practice is based.

Structural Engineering covers such a broad field that no one can become expert in its whole extent. It includes the design and construction of girders, columns, roofs, trusses, arches, bridges, buildings, walks, dams, foundations and all fixed structures and movable bridges. It includes also a knowledge of the relative merits of the design and construction of buildings, bridges and structures composed of the different materials used by the engineer, such as concrete, reinforced concrete, timber, cast iron and steel. Structural Engineering also includes cost accounting, plan reading and estimating.

The course is designed to prepare the young engineer to take up the work of assisting in the design and construction of structures; to undertake intelligently supervision of erection work in the field and general contracting.



# COURSE III

## STRUCTURAL ENGINEERING

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### First Year

	SUBJECT NUMBER
Mathematics I . . . . .	10
Practical Physics . . . . .	20
Mechanical Drawing . . . . .	40

### Second Year

Mathematics II . . . . .	11
Structural Mechanics . . . . .	32
Structural Drawing . . . . .	73

### Third Year

Theory of Structures . . . . .	70
Strength of Materials . . . . .	33
Structural Design . . . . .	74

### Fourth Year

Advanced Structures . . . . .	72
Bridge Design . . . . .	71
Concrete Construction . . . . .	80

## *EVENING SCHOOL OF ENGINEERING*

### **ELECTRICAL ENGINEERING**

The course in electrical engineering is intended primarily to cover the needs of two classes of men: (1) men who are working in the electrical or mechanical trades involving the use of electricity, who desire to increase their knowledge of practical electricity and to gain a thorough understanding of the electrical engineering principles and their broader application, so as to prepare themselves for positions of foremen, superintendents, or operating managers, in their particular field; (2) young men in business, possessing a good general education, who wish to gain a knowledge of the technical matters of electricity, together with a sufficiently broad conception of the theories underlying all electrical engineering work, in order to render themselves more useful in their line of business, by the combined general and technical training.

The ideal condition for laying out a single course to serve the variety of needs, represented by the individual interests of the students, would obviously be exact equality of preparation for all students beginning the work of the first year. Though such equality cannot be expected of all the men entering the first year, there must be a certain general basis of preparation, in order that the work may be of the greatest benefit to the largest number of men; therefore, the work of the first year has been laid out in such a way as to be of no special difficulty to those with a high school training, or the equivalent thereof; at the same time, certain men who have not had such preparation, but whose experience in practical life has sufficiently matured them, should be able to enter the first year with success, though they may be required to make up some of the preparatory work, while they may be excused from certain portions of the practical work with which their experience may have brought them into contact. It is recommended that such men should consult with the Dean or the course head in arranging their schedule. In general, a man entering the first year should (1) have easy command of the English language, so that he may be able to express himself and write clearly, (2) be familiar with elementary mathematics and algebra.

# COURSE IV

## ELECTRICAL ENGINEERING

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### First Year

	SUBJECT NUMBER
Mathematics I . . . . .	10
Practical Physics . . . . .	20
Mechanical Drawing . . . . .	40

### Second Year

Mathematics II . . . . .	11
*Mechanism . . . . .	90
*Elements of Electricity, Lectures . . . . .	126
*Elements of Electricity, Laboratory . . . . .	127
**Direct Current Machinery, Lectures . . . . .	122
**Direct Current Machinery, Laboratory . . . . .	124

### Third Year

*Direct Current Machinery, Lectures . . . . .	122
**Direct Current Machinery, Laboratory . . . . .	124
Applied Mechanics I A . . . . .	31
Thermodynamics . . . . .	95
Alternating Currents and Electrical Measurements, Lectures . . . . .	138
Alternating Currents and Electrical Measurements, Laboratory . . . . .	138A

### Fourth Year

Alternating Current Machinery, Lectures . . . . .	139
Alternating Current Machinery, Laboratory . . . . .	139A
Generation and Utilization of Power . . . . .	136

\*First term.

\*\*Second term.

## CHEMICAL ENGINEERING

The wonderful advance in the application of science to the arts during the past few years has caused a great demand for technically trained men. Nearly every large manufacturing concern now employs chemists regularly, or else has experts whom it can consult at short notice. The scientific and technical schools are each year sending out large classes of young men, especially trained to meet this demand. For a young man to acquire this education requires four years at a scientific, or technical school, in addition to the four years necessary for preparation at the secondary school, and an outlay of from two to three thousand dollars. These necessary expenditures of time and money are such that many young men, who are mentally capable of taking such courses, are obliged to give up their ambitions and fill inferior positions.

Formerly the practical knowledge which young men acquired by contact with their work was sufficient, but today the degree of specialization is such that a theoretical knowledge is essential to success in many industries where chemical processes are utilized.

There are many men who, by close application to the practical side, have acquired responsible positions in technical industries, but are unfamiliar with the theoretical side of their chosen work.

Such men are unable to advance in their special lines, because they cannot read the many valuable books written on special technical subjects, which presuppose a general knowledge of the theory of chemistry.

At the present time, the requirements of admission to the higher institutions of learning, even for special students, are such that the doors are practically closed to these men, although many of them could take special courses with profit. Again, the only available hours for such men are during the evening. There is a demand, therefore, for a systematic evening course in chemistry, which will be open to men engaged at the present time in technical industries.

Students are especially urged to take the entire work on the schedule of each year. A good grounding in mathematics, physics and German is essential to success in the chemical subjects of the third and fourth years.

# COURSE V

## CHEMICAL ENGINEERING

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### First Year

	SUBJECT NUMBER
Mathematics I . . . . .	10
Inorganic Chemistry, Lectures . . . . .	140
Inorganic Chemistry, Laboratory . . . . .	141

### Second Year

Qualitative Analysis, Lectures . . . . .	142
Qualitative Analysis, Laboratory . . . . .	143
Elements of Physics . . . . .	21

### Third Year

(Omitted 1917-1918)

Volumetric Analysis . . . . .	144A
Gravimetric Analysis . . . . .	144B
German I . . . . .	170

### Fourth Year

Organic Chemistry, Lectures . . . . .	145
Organic Chemistry, Laboratory . . . . .	145A
Principles of Chemistry I . . . . .	149
German II . . . . .	171

### Fifth Year

*(Only offered when sufficient students enroll for it to justify giving the work.)*

Technical Analysis . . . . .	148
Principles of Chemistry II . . . . .	149A
Industrial Chemistry . . . . .	146
Thermodynamics . . . . .	95

## Subjects for Instruction

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Instruction is given by lectures and recitations, and by practical exercises in the field, the laboratories, and the drawing rooms. A great value is set upon the educational effect of these exercises, and they form the foundation of each of the four courses. Text-books are used in many subjects, but not in all. In many branches the instruction given differs widely from available text-books; and, in most of such cases, notes on the lectures and laboratory work are issued, and are furnished to the students. Besides oral examinations in connection with the ordinary exercises, written examinations are held from time to time. At the close of the year general examinations are held.

In the following pages will be found a more or less detailed statement of the scope, as well as the method of instruction, of the subjects offered in the various courses. The subjects are classified, as far as possible, related studies being arranged in sequence.

The subjects are numbered, or numbered and lettered, for convenience of reference in consulting the various Course Schedules. As the total number of hours per term devoted to a subject sometimes varies in different courses, these hours are not in every case given in connection with the following descriptions.

By careful consideration of the Course Schedules, in connection with the following Description of Subjects, the applicant for a special course may select, for the earlier part of that course, such subjects as will enable him to pursue later those more advanced subjects which he may particularly desire.

The topics, included in the list which follows, are subject to change at any time by action of the School authorities.



## SYNOPSIS OF SUBJECTS

### SYNOPSIS OF SUBJECTS

#### 10. Mathematics I

*Preparation: Elementary Algebra and Plane Geometry.*

This course includes:

Review of Algebra up to and including simple equations. Radicals, imaginaries, quadratic equations, ratio and proportion, variation, the use of formulæ, with applications to problems in Physics and Engineering.

Review of Geometry, with special reference to problems in mensuration.

Logarithms, the use of slide rules, discussion of precision, and rules for significant figures.

Trigonometry, including circular measure, co-ordinates, trigonometric ratios, formulæ, law of sines, law of cosines, solution of right and oblique triangles, applications to problems in Physics and Engineering.

#### 11. Mathematics II

*Preparation: Mathematics I.*

This course of two periods per week during the second year is a continuation of Mathematics I. It includes:

Plotting of functions, interpolation, the straight line, equations of the conic sections, curves represented by various equations common in practice, graphic solution of equations, determination of laws from the data of experiments, simplification of formulæ.

Rate of change, differentiation, determination of maxima and minima by differentiation, integration, definite integrals, determination of mean value, area, and volume by integration, centre of gravity, moment of inertia.

#### 20. Practical Physics

This course consists of two lectures per week, on Monday and Thursday evenings, throughout the year. Instruction is given in the practical application of physical laws. Each lecture, as far as possible, is accompanied by practical tests in the lecture room on large size apparatus, built especially for this course, so that the student may actually see a demonstra-

## *EVENING SCHOOL OF ENGINEERING*

tion of the truth of the various laws, thus enabling him to grasp readily the underlying principles. The course is devoted to a study of the mechanics of solids, liquids and gases, heat and its effects, together with lectures on light and sound. Practical problems covering each phase of the work are given throughout the year which are designed to fix in the student's mind the fundamental principles taken up in the lectures. The supplies for this course are a set of notes on "Practical Physics" prepared by C. S. Ell, a pair of small four- or five-inch triangles and a four-inch cardboard protractor.

### **21. Elements of Physics**

A course of experimental lectures and exercises, designed especially for students of Chemistry. The work is devoted to a study of the mechanics of solids, liquids, and gases; heat and its effects; and elementary electricity. The problems are also planned to give drill work in Mathematics in its applications to Physics.

### **30. Applied Mechanics I**

The subject comprises a study of the general methods and applications of statics, including the determination of reactions, stresses in frames, of distributed forces, center of gravity, of moment of inertia and radius of gyration of plane areas and solids. Kinematics and dynamics are also taken up.

### **31. Applied Mechanics 1A**

This course, which is a briefer one than Course 30, covers only the fundamental principles and their applications, in place of the full treatment of the subject that is carried out in Course 30.

### **32. Structural Mechanics**

This course covers the fundamental principles of statics, including the study of systems of balanced and unbalanced forces; determination of reactions and stresses in framed structures; a study of the centre of gravity and moment of inertia of plane figures, shear and moment diagrams, and the application of the various principles of mechanics to the solution of simple structural problems. The work consists of

## SYNOPSIS OF SUBJECTS

lectures, recitations, and the solution of problems, many of which are done in the class room.

### 33. Strength of Materials

This course consists of lectures, recitations and the solution of problems. Instruction is given in the strength of materials, mathematically treated, including the stresses and strains in bodies subjected to tension, to compression and to shearing; common theory of beams, with thorough discussion of the distribution of stresses, shearing forces, bending moments, slopes, and deflections.

A study is also made of the strength of hooks, columns, shafts, and springs, and combined stresses in beams subjected to tension and compression, as well as bending. A brief consideration of strains, and the relations of the stresses on different planes in a body and the stresses in simple framed structures subjected to bending forces, is also taken up.

The latter part of the course is devoted to a study of the methods of manufacturing, properties, and strength of various materials used by the engineer. All the structural materials commonly used are considered, such as lime, cement, concrete, timber, brick, iron, steel and stone. A study is also made of the results of tests on these materials.

### 40. Mechanical Drawing

This course consists of work of an elementary character, beginning with instruction in the use of instruments and the fundamental rules for executing engineering drawings. In conjunction with the drawing, the elementary principles of orthographic projections are studied, and the student prepares a number of plates illustrating the reproduction of objects in the shape of working drawings.

### 50. Surveying and Plotting.

*Preparation: Trigonometry or Math. II (II).*

The first term is devoted to a study of surveying instruments, the methods of making surveys and the solution of problems in plane surveying.

In the second term, the methods used in topographic surveying, together with the problems relating thereto, are taken

## EVENING SCHOOL OF ENGINEERING

up in detail, as well as advanced and special problems in plane surveying.

Special emphasis is laid on the construction and use of the various kinds of maps and plans with which the surveyor should be familiar.

### 51. Advanced Surveying.

*Preparation: Surveying and Plotting (50).*

This course consists of instruction in the higher problems in surveying, such as triangulation, precise, trigonometric and barometric leveling. Map projection, and the plane table are discussed.

### 54. Topographical Drawing

*Preparation: Mechanical Drawing (40).*

This course is primarily designed to give training in the interpretation and drawing of topographical maps. It is devoted to the study of the different conventional signs employed, and each student is required to make a number of plates and to become reasonably proficient in the preparation of such maps. Particular attention is given to the study of contour maps, and the solution of problems relating thereto.

### 55. Municipal Engineering Problems

A course dealing with various engineering problems encountered by town and city engineers, such as construction of sewers, retaining walls, bridges, grade crossing problems, making of contracts and writing specifications for various construction work, methods of inspection and handling of public service properties, such as poles, lines, conduits, tracks, etc.

### 56. Highway Engineering

A course in which are treated the following subjects:

The construction of roads and city streets, the problems of drainage and maintenance, qualities of trap rocks, good gravel, binding materials, paving blocks and bricks, concrete foundations, and the uses of asphaltic oils and other bituminous materials.

## SYNOPSIS OF SUBJECTS

### 57. Railroad Engineering

*Preparation: Surveying and Plotting (50).*

This course in railroad engineering consists of the computation and methods of laying out simple, compound, reverse, and easement curves; frogs, switches, and turnouts; the computation of earthwork by different methods, slope stakes, borrow pits and cross section work.

### 58. Railroad Engineering Drawing

*Preparation: Surveying and Plotting (50).*

From field notes, a map and profile of a preliminary survey for a railroad are plotted. The location is discussed and adjusted to the preliminary map. Other drawings involving the study of problems common to railroad practice will be taken up. The course is supplemented by lectures.

### 59. Railroad Engineering and Railroad Design

*Preparation: Railroad Engineering (57) and Railroad Engineering Drawing (58).*

This course consists of a study of yard design, passenger and freight yards, gravity yards, hump yards, yard accessories, stations, terminals, elimination of grade crossings, signals, methods of construction and making estimates.

A large part of the work is supplemented by lectures.

### 70. Theory of Structures

This course consists of lectures, recitations and solution of problems. Instruction is given in the fundamental theory of structures, including the theory of beams, computation of reactions, moments, and shears for static and moving loads. The work in the class-room is supplemented by the solution of many practical problems in the drawing room.

### 71. Bridge Design

Most of the work of this course is done in the drawing room, but instruction is given from time to time by means



## *EVENING SCHOOL OF ENGINEERING*

of lectures. The work includes the execution of complete designs for several types of structures, such as railroad bridges and building trusses, and the execution of complete working drawings.

### **72. Advanced Structures**

This course is a continuation of the theory of structures given in the third year, and takes up the fundamental principles involved in the design of various engineering structures, such as buildings, bridges, retaining walls, arches and other structures, as the time permits. Instruction is given by means of lectures and recitations, and the various theoretical principles are applied in the execution of practical designs in the drawing room.

### **73. Structural Drawing**

The course in structural drawing consists in the working out of various graphical problems of mechanics on the drawing board, drawing standard sections of structural steel shapes, structural details and the preparation of drawings, representing simple structures. The purpose of this course is to familiarize the student with detailed drawings and teach him where and how to dimension structural parts on working drawings.

### **74. Structural Design**

The course in structural design consists of work in the drawing room. It is a continuation of the course in structural drawing given in the second year, and includes the execution of elementary structural design, taking up in a practical way the principles given in the course in Theory of Structures. Each student is given data for various problems, the designs for which he works out in the drawing-room, making all necessary computations and executing all drawings necessary for the preparation of a complete design of a number of engineering structures.

### **80. Concrete Construction**

In this course instruction is given in the history and early use of cement; different kinds of cement manufacture; sand, gravel, broken stones, and methods of mixing; description



## SYNOPSIS OF SUBJECTS

of concrete work; roadways, sidewalks, building work, footings, foundations, conveying concrete, placing, finishing and waterproofing; principles of reinforced concrete, formulas for calculating strength, tables of strength, values; reinforcing steel, expanded metals, wire fabrics; design and construction. Simple formulas and application, use of tables, beams, and girders, bearing power of soil, forms and molds, removal of forms, problems in beam, slab and girder designs, and arches. Cost estimating and requirements of the building laws.

### **81. Materials of Construction**

A course taking up a consideration of the properties of the various materials used in engineering construction, such as wood, iron, steel, brick, stone, cement and concrete.

### **82. Foundations**

A course covering the method of construction and design of the various kinds of foundations used in engineering construction, together with a study of the bearing power of different kinds of soil.

### **90. Mechanism**

This course takes up a study of the principles in machinery and power transmission apparatus. The problem work goes into the design of pulleys, belts, gearing and gear teeth development, cams, and quick return motions found in machine tools such as shapers, slotters, and planers.

### **91. Mechanical Engineering Drawing**

This course of one and one-half hours per week supplements the course in mechanism. It consists in the actual design of cams and gears, with graphical solution of velocity and force problems.

### **92. Machine Drawing**

The aim of the course is to teach the proper way of making the necessary dimensioned drawings for use in practice. The instruction includes: (a) The making of sketches of the parts of a machine from measurements; (b) the detail scale drawing from the sketches and a tracing; (c) an assembly drawing of the machine.

## *EVENING SCHOOL OF ENGINEERING*

### **95. Thermodynamics**

This course of one hour per week during the third year is devoted to the study of the theory of perfect gases and thermodynamics. The use of steam and entropy tables and solutions of general problems in steam; also heating and ventilation.

### **95A. Boilers and Prime Movers**

This course of two and one half hours per week, in the fourth year, is devoted to the study of the practical operation of boilers and boiler accessories and the principles of boiler design. The work also covers the essentials of steam engine and turbine design and strength of parts of steam engines such as piston rods, cylinders, crossheads, flywheels, etc.

### **96. Power Plant Design**

A course of one and one half hours per week, partly lectures and partly drawing room work, in power plant design and layout. The course treats of the proper layout of boilers, pipes, condensers, separators, ash and coal handling machinery, and calculation of the building itself, as well as engine beds, chimney design, and chimney foundations.

### **112. Hydraulic Engineering**

A course of one and one half hours per week. The course consists of two parts. The first is devoted to the study of theoretical hydraulics dealing with hydrostatic and hydrodynamic pressure, the flow of water through channels, pipes, orifices and nozzles and over weirs. The second part deals with such practical problems as the study of stream flow and storage and the development of water power.

### **122. Direct Current Machinery**

A course of lectures and recitations consisting of three hours per week during the last fourteen weeks of the second year, and two and one half hours per week during the first fourteen weeks of the third year. The course is devoted to the study of the principles and operation of direct current machinery. The following topics are considered: direct current generators and motors, their construction, operation, and

## SYNOPSIS OF SUBJECTS

application; direct current systems, involving the use of generators, motors, storage batteries, etc., in combination; electric lighting and photometry.

### **124. Direct Current Machinery, Laboratory**

This course of one evening per week during the last fourteen weeks of the second year and the first fourteen weeks of the third year, is taken simultaneously with the corresponding lecture course (122), and the experiments are intended to supplement the class-room work of that course. The experiments cover the operation of a dynamo as a motor and generator, the photometer, etc. The characteristics of direct current generators and motors are determined experimentally; efficiency, losses, regulation and heating are carefully studied in the laboratory. Each student is required to furnish a complete report, including theory, method of procedure, results, and conclusions on each experiment performed by him.

### **126. Elements of Electricity**

A course of lectures and recitations, one and one half hours per week, during the first fourteen weeks of the school year. The course deals with the fundamental laws and properties of electric and magnetic circuits and their application to the similar types of electrical apparatus. Among the subjects studied are units of resistance, current, potential, and power, Ohm's Law and Kirchoff's Law.

### **127. Elements of Electricity, Laboratory**

This course of one evening per week, during the first fourteen weeks of the second year, is taken in connection with the corresponding lecture course (126). The experiments are intended to supplement the classroom work.

### **136. Generation Transmission and Utilization of Power**

A course of lectures, recitations, and problem work, two hours per week, for twenty-eight weeks. This course is intended to cover the field of electrical engineering in a broader and more general way than do the other courses previously described. It deals with the various types of generating stations, some of the features of long distance power transmission, the application of electric power to railways, etc.

## *EVENING SCHOOL OF ENGINEERING*

### **138. Alternating Currents and Electrical Measurements**

A course of lectures, recitations and problem work during the last fourteen weeks of the third year. The principles of electromagnetism, electrostatics, variable currents and harmonic alternating currents, including single and polyphase circuits, are carefully studied. This course also includes a brief discussion of the theory, construction and operation, of the more common types of measuring instruments and testing processes.

#### **138A. Alternating Currents and Electrical Measurements, Laboratory**

A course of one evening per week during the last fourteen weeks of the third year. The course is devoted to the experimental study of alternating current circuits, power measurements in single and polyphase circuits, and selected experiments in direct and alternating current measurements.

### **139. Alternating Current Machinery**

A course of lectures, recitations, and problem work, consisting of three hours per week for twenty-eight weeks. The course is devoted to a detailed study of the common types of alternating current machines, including the transformer, alternator, induction motor, synchronous motor, rotary converter, etc.

#### **139A. Alternating Current Machinery, Laboratory**

This course of one evening per week, for twenty-eight weeks, consists of laboratory exercises devoted to experimental study of the transformer, alternator, and other types of alternating current apparatus, supplementing the corresponding class-room work of Course 139.

### **140. Inorganic Chemistry**

A course of experimental lectures on the fundamental laws and principles of inorganic chemistry. The work aims to familiarize the student with the properties and preparation of the following elements and their most important compounds: —oxygen, hydrogen, the halogens, sulfur, nitrogen, phos-

## SYNOPSIS OF SUBJECTS

phorus, carbon, silicon, the alkali and alkaline earth groups, iron and aluminum. The course is to be taken in conjunction with (141).

### **141. Inorganic Chemistry Laboratory**

A laboratory course in which the student is expected to verify and illustrate the facts and principles that have been discussed in the lectures. To be taken in conjunction with (140).

### **142. Qualitative Analysis**

A practical course in qualitative analysis relating to the identification of the common metallic elements and the ordinary acids.

### **143. Qualitative Analysis, Laboratory**

*Preparation:* 142.

A practical course in qualitative analysis for the separation and identification of the common metallic elements and the acids. Each student is also required to make a complete and accurate analysis of various mixtures, alloys and chemicals used in manufacturing.

### **144A. Volumetric Analysis**

A course on volumetric determinations, involving the use and the standardization of burettes, pipettes and measuring flasks. The work includes alkalimetry, acidemetry, indicators, oxidimetry, iodimetry, chlorimetry. The laboratory work is supplemented by lectures and conferences.

### **14B. Gravimetric Analysis**

A course devoted to the principles and practice of gravimetric analysis. The laboratory work is supplemented by lectures and conferences.

### **145. Organic Chemistry**

The course is devoted to lectures and conferences on the principles of organic chemistry, as illustrated by the methane and benzene derivations.



## *EVENING SCHOOL OF ENGINEERING*

### **145A. Organic Chemistry, Laboratory**

In this course the student is required to prepare in the laboratory a number of organic compounds, selected to show the characteristic reactions, and to give training in the practical separation and purification of organic substances. After this synthetic work, the students are given a practical course in organic analysis.

### **146. Industrial Chemistry**

A course of lectures and conferences on the more important chemical processes. Attention is given to many operations of a general nature common to chemical industries, such as crushing, grinding, filtration, evaporation, distillation, etc., and to the apparatus employed in these processes. Some of the more important industries will be taken up in detail.

### **148. Technical Analysis**

A course on the following:

Analysis of gases.

Analysis and testing of mineral, animal and vegetable oils.

The origin, manufacture, properties, uses and analysis of the various fuels, and the determination of the heat value of fuels by the use of a calorimetric bomb.

### **149 and 149A. Principles of Chemistry I and II**

A course of lectures and conferences on chemical equilibrium and electro-chemical topics. The work includes lecture experiments and discussion of problems on the law of mass action, applied to the rate and equilibrium of chemical reactions, the effect of temperature and pressure, the conduction of electricity by solutions, the production of electricity by chemical change, the electromotive force of voltaic cells and single potential differences. Problems for independent solution by the student are also given.

### **170 and 171. German I and II**

These courses of one hour per week throughout the third and fourth years respectively, are planned to give the student a knowledge of German grammar as well as a working vocabulary of scientific terms.

## SPECIAL COURSES

# Special Courses

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## DEPARTMENT OF DRAWING

### *Instructors:*

MR. JAMES BROUGH

MR. E. W. G. SMITH

MR. GEORGE A. TRUELSON

The courses in Free Hand Mechanical and Architectural Drawing and Industrial Design, as outlined, afford the essentials of drafting for those contemplating office work and are equally valuable and necessary to those working in the allied trades.

The art courses are varied and the work is thorough, complete, and of a high order. Great care is taken to develop the student along the line of his natural inclinations, and, so far as possible, to have the work of the school bear directly upon his daily employment and other courses attended.

### **301. Advanced Mechanical Drawing and Orthographic Projections**

This course is a continuation of Mechanical Drawing (40). It includes:

Problems on the point, line and plane, projections of solids, single and double curved surfaces and their intersections by oblique planes, and practical illustrations of the principles studied.

### **310. Architectural Drawing I**

An elementary course, including the fundamental principles underlying all kinds of mechanical and architectural drawing; geometrical problems; orthographic and isometric projections; classical mouldings; Roman alphabet, and roof problems.

In connection with this course the instructor will outline a course of reading in architectural history.



## EVENING SCHOOL OF ENGINEERING

### 311. Architectural Drawing II

The orders of Architecture. Practical architecture and details of construction. In this course the student is taught the component parts of buildings. Typical details of construction are drawn to a large scale and in isometric projection.

### 312. Architectural Drawing III

This course covers the making of complete plans, elevations and working drawings of some elementary problem.

#### *Special Students*

Students desiring special work in Architectural Drawing, not outlined above, should consult with the instructor.

### 320 and 321. Freehand Drawing

Considering the great importance of the study of freehand drawing to all who are engaged in, or anticipate being engaged in any industrial art, artistic trade or profession, we offer a very complete course in this line, and call attention to the splendid advantages provided.

The work is adapted to the requirements of each individual student, so far as is practical and consistent with a thorough training in freehand drawing. There are two classes in both freehand drawing and industrial design.

Class I. The work of this class is intended to meet the wants of those students who have no previous knowledge of freehand drawing and is recommended to all students who intend to become craftsmen, designers, architects or artists, and also to others who may wish to take up the study as an accomplishment. The work will consist of drawing from typical models, by which students learn a sense of proportion and the principles of perspective; groups of still life for the study of composition and color; also drawing of historic ornament, and details of the human figure from the cast, by which students are taught to observe form, and the principles of light and shade.

## *SPECIAL COURSES*

Class II. The course of study in this class is of a more advanced nature than that of Class I, and in addition to the more complicated forms of ornament, the full-length human figure from the antique is added, also rendering in pen and ink and pencil, advanced shading in charcoal, painting groups of still life in monochrome and polychrome, in oil and water colors.

### **322. Industrial Design and Interior Decoration**

The courses in industrial design and interior decoration are specially helpful to those students who are already engaged in or anticipate being engaged in such arts and crafts, as wood and stone carving, wrought and bent-iron work, brass and copper work, stained glass, furniture and drapery, interior decoration, book covers, wall paper, fabrics and other allied industrial arts, including lettering and commercial designing for advertising purposes. No limitation is placed upon the student who shows ability to take up the work prescribed for the class he wishes to enter, and students who so desire may spend part of their time in the freehand class and part in the industrial design and interior decoration class, without extra charge. The instructor is a certified art master and one of the leaders of the profession. Students in industrial design are recommended to take architecture.

### **323. Life Class**

At the repeated request of a number of advanced students we offer this class which will give an exceptional opportunity to students who wish to pursue their studies for the purpose of acquiring a more perfect knowledge of the figure, and will be of great advantage to those who wish to become more proficient in this branch of art. At the present time the use of the figure is introduced into nearly every form of art work, not only in a purely artistic sense, but also in many forms of commercial work, and to be able to draw the figure well is a great achievement to the artist and designer. This work will only be given when a sufficient number of students enroll for it.

## **Equipment**

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The school is now housed in the new building of the Association, and has very exceptionally equipped quarters for carrying on the work of the Engineering Courses.

### **MECHANICAL ENGINEERING DEPARTMENT**

Our steam engineering plant is completely equipped with meters, scales, indicators, and all the necessary accessory equipment for making complete boiler tests, and determining the efficiencies of the various appliances used in generating power, heat, and light for our new building. This places at the disposal of our classes a perfectly equipped, up-to-date, engineering department, and gives them the means of carrying on boiler tests, determining the efficiencies of various fuels and oils, taking indicator diagrams, determining the efficiency of modern reciprocating engines and turbines when direct connected to generators, as well as renders them familiar with all the various auxiliary appliances of such a plant, as condensers, pumps, air compressors, etc. The students also have the use of the equipment of our Automobile School, thus giving opportunity to study the most advanced ideas in gasoline engine practice.

### **Mechanic Arts Laboratories**

There are at present two laboratories, one for metal work and the other for woodworking and pattern work, which are available for the use of our students.

The metal working laboratory is well equipped, and affords the student an opportunity for work with various machines, as lathes, shapers, drill presses and milling machines. There are also a gas forge and brazing furnace, together with all the required equipment for bench work instruction.

The woodworking laboratory has a power band saw, lathes, circular saw, buzz planer, and all the necessary equipment for woodworking and pattern work.

In addition to the foregoing, a small but completely equipped shop for the construction and repair of apparatus and for the

## *EQUIPMENT OF THE SCHOOL*

use of students in connection with their thesis work has been installed. This shop is equipped with a metal and woodworking lathe, grinder, and all the necessary wood and metal-working tools. There is also a very complete set of cabinet-worker's tools for use in woodworking.

### **CIVIL ENGINEERING DEPARTMENT**

#### **Field Instruments**

For work in the field the Department possesses various surveying instruments, representing the principal makes and types of instruments in general use. The equipment includes transits, levels, compasses, a complete plane table outfit, Locke hand level, flag poles, leveling rods, stadia rod, engineers' and surveyors' chains, steel and cloth tapes and other accessories. For higher surveying, an aneroid barometer is used for barometric leveling, and the transits are equipped with neutral glasses and reflectors for astronomical observations, as well as a sextant, reading to ten seconds, and equipped with neutral glasses and telescopes. Last year a Buff and Buff Plane Table Outfit and a Berger 18-inch Wye Level, as well as several smaller instruments, were added to the equipment.

The scope of the equipment and the field work itself are designed to train the student's judgment as to the relative merits of the various types of field instruments.

#### **Design and Drafting Rooms**

The School possesses large, light, and well-equipped drawing rooms for the carrying on of the designing and drafting, which form so important a part of civil engineering work. These rooms are supplied with lockers containing the drawing supplies, and files containing blue prints and photographs of structures that represent the best practice. Many of the prints and photographs are of structures erected in and about Boston.

### **ELECTRICAL ENGINEERING DEPARTMENT**

The Electrical Measurements Laboratory is well equipped with apparatus for teaching the principles of measurements, and the equipment is being steadily increased and developed for the performance of a wider range of work. The special

## *EVENING SCHOOL OF ENGINEERING*

pieces of apparatus are as follows: A modified form of Conductivity Bridge, a Laboratory Wheatstone Bridge, a Leeds and Northrup Potentiometer with volt box, standard cells and low resistance standards, and a chemical balance. A 600 ampere-hour storage battery has been added to the equipment for current tests, while for voltage work there is a high-voltage direct-current generator, having separate field excitation and speed control, for wide range of voltage adjustment.

Among the instruments used for alternating current testing are the following: Three General Electric wattmeters, constructed for Y connection; a General Electric polyphase indicating wattmeter, with double current and potential ranges; a General Electric indicating wattmeter, with double current and potential ranges, constructed for the measurement of transformer core loss, three Thomson high-torque induction watt-hour meters, with special gear trains for short-time readings; a General Electric and a Westinghouse, switchboard type, integrating watt-hour meter, and a Thomson rotating standard test meter. There is also a large number of indicating ammeters and voltmeters, and auxiliary testing apparatus, such as synchronism and frequency indicators.

For direct current testing there is a considerable number of Weston and General Electric ammeters and voltmeters of suitable ranges, and two Thomson integrating watt-hour meters.

There is also an increasing assortment of testing devices, such as speed counters, tachometers, brakes, loading resistances, and numerous minor pieces of apparatus needed in the practical operation and testing of electrical machinery.

Among the machines of this department are a pair of specially made matched machines, constructed to operate as single, two, or three phase generators, or motors, as well as synchronous converters, or double current generators. On the direct-current side, these machines will operate as shunt, series, or compound generators, either two or three wire, or as shunt, series, or compound motors. There is also a 15 H. P. Westinghouse compound motor, a 3 K. W. compound genera-



## *EQUIPMENT OF THE SCHOOL*

tor, two one-half H. P. series motors, a one-half H. P. shunt motor, and a 1 K. W. series generator. During the past year there has been added a 5 H. P. General Electric interpole motor, a 5 H. P. General Electric series motor, a 4 H. P. shunt motor, two 3 H. P. shunt motors, and a 2 H. P. shunt motor.

There is also a 7½ kv-a. special General Electric alternator driven by a 10 H. P. General Electric interpole motor, and a 5 kv-a. Holtzer-Cabot alternator driven by a 10 H. P. Fort Wayne shunt motor. This latter machine has two special rotors, permitting its use as a squirrel-cage or phase-wound, induction motor. In addition, there is a 5 K. W. Holtzer-Cabot three-phase synchronous convertor, a 5 H. P. General Electric induction motor, which can be operated two or three phase, a 45 kv-a. single phase alternator, giving practically a pure sine wave, and three General Electric transformers, each of 3 kv-a. capacity. During the past year there has been added three special 1 K. W. single-phase transformers, each of 3 kv-a. capacity.

There is also available for advanced instruction, in co-operation with the Mechanical Engineering Department, the four three-wire generators in the main generating plant. Two of these generators are driven by Ridgeway reciprocating engines and two by Westinghouse-Parsons turbines.

## **DEPARTMENT OF PHYSICS**

There is a large laboratory devoted entirely to Physics, together with a lecture room.

The Physics Department has been very completely equipped with all necessary apparatus for the experimental work that is required of the students, as well as that required for lecture demonstration. Among other things have been added. verniers, levels, spherometers, calorimeters, thermometers, pyrometers, a spectroscope, a microscope, a spectrometer, balances, standard gram weight, lecture table galvanometer, optical disk with all accessories, lenses, photometer, a full set of Weather Bureau apparatus, including a barograph, thermograph, hygrometer, barometer, maximum and minimum thermometers,

## *EVENING SCHOOL OF ENGINEERING*

etc. These, in addition to the equipment already owned, give a wide range to the experimental work that can be done.

### **DEPARTMENT OF CHEMISTRY**

This Department is completely equipped in all respects for carrying on all lines of Chemical work, from that of a high school to that of most advanced college grade. The three laboratories, with accommodations for over one hundred and fifty students, are very exceptionally furnished with all the necessary appliances for chemical work. Some of these are: hoods, drying closets, still, steam and hot water baths, electrolytic circuits, vacuum and pressure apparatus, balances, combustion furnaces, complete sets of apparatus for the sampling and analysis of flue gases and fuels. There are also testing machines for oils, viscosimeters, and different sorts of flash point apparatus. A chemical museum is connected with this Department where are kept specimens for purposes of illustration.

### **LIBRARIES**

There is in connection with the School, a professional library containing books pertaining to both the school work of the students and to their practical work. In addition to this there also are current periodicals on engineering and scientific subjects for their exclusive use. All members of the School are entitled to take books from the Boston Public Library, and this offers a very unusual opportunity to our non-resident students.

### **DEPARTMENT OF PHYSICAL TRAINING**

Our new gymnasium with all the latest modern equipment gives ample accommodation for all students.

There is a running track on the grounds adjoining, together with tennis and hand ball courts; also a large natatorium where swimming is taught by competent instructors.

In connection with this Department there are also six excellent bowling alleys, which may be used by the students upon the payment of a nominal fee.

For all further information, write

THE EVENING SCHOOL OF ENGINEERING,  
316 Huntington Ave., Boston, Mass.



# COURSES OF STUDY

## Courses of Study

### SCHEDULE OF ENGINEERING SUBJECTS

Subject Number	Subject	Evenings	Time
10	Mathematics I	Mon. and Thurs.	7.00—8.15
11	Mathematics II	Mon. and Thurs.	8.15—9.30
20	Practical Physics	Mon. and Thurs.	8.15—9.30
21	Elements of Physics	Mon. and Thurs.	8.15—9.00
30	Applied Mechanics I	Mon. and Thurs.	8.15—9.30
31	Applied Mechanics I A	Friday	8.15—9.30
32	Structural Mechanics	Mon. and Thurs.	7.00—8.15
33	Strength of Materials	Mon. and Thurs.	7.00—8.15
40	Mechanical Drawing	Wednesday	7.00—9.30
50	Surveying and Plotting	Mon. and Thurs.	7.00—8.15
51	Advanced Surveying	Mon. and Thurs.	7.00—8.15
54	Topographical Drawing	Tuesday	7.00—8.15
55	Municipal Engineering Prob- lems	Wed.	7.00—9.30
56	Highway Engineering	Tues.	8.15—9.30
57	Railroad Engineering	Mon. and Thurs.	8.15—9.30
58	Railroad Engineering Draw- ing	Fri.	7.00—9.30
59	Railroad Engineering and Railroad Design	Wed.	7.00—9.30
70	Theory of Structures	Mon. and Thurs.	8.15—9.30
71	Bridge Design	Fri.	7.00—9.30
72	Advanced Structures	Mon. and Thurs.	8.15—9.30
73	Structural Drawing	Tues.	7.00—9.30
74	Structural Design	Fri.	7.00—9.30
80	Concrete Construction	Mon. and Thurs.	7.00—8.15
81	Materials of Construction	Mon. and Thurs.	7.00—8.15
82	Foundations	Mon. and Thurs.	7.00—8.15
90	Mechanism	Mon.	7.00—8.15
91	Mechanical Engineering Drawing	Thurs.	7.00—8.15
92	Machine Drawing	Wed.	7.00—9.30
95	Thermodynamics	Tues.	8.15—9.30
95A	Boilers and Prime Movers	Mon. and Thurs.	8.15—9.30
96	Power Plant Design	Tues.	7.00—9.30
112	Hydraulic Engineering	Tues.	7.00—8.15
122	Direct Current Machinery, Lectures	Mon. and Thurs.	7.00—8.15
124	Direct Current Machinery, Laboratory	Wed.	7.00—9.30
126	Elements of Electricity, Lectures	Thurs.	7.00—8.15
127	Elements of Electricity, Laboratory	Wed.	7.00—9.30
136	Generation, Transmission and Utilization of Power	Tues. and Fri.	7.00—8.15
138	Alternating Currents and Electrical Measurements, Lectures	Tues. and Fri.	7.00—8.15

## EVENING SCHOOL OF ENGINEERING

138A	Alternating Currents and Electrical Measurements, Laboratory	Wed.	7.00—9.30
139	Alternating Current Machinery, Lectures	Tues. and Fri.	8.15—9.30
139A	Alternating Current Machinery, Laboratory	Mon.	7.00—9.30
140	Inorganic Chemistry, Lectures	Mon. and Thurs.	8.15—9.30
141	Inorganic Chemistry, Laboratory	Wed.	7.00—9.30
142	Qualitative Analysis, Lectures	Mon.	7.00—8.15
143	Qualitative Analysis, Laboratory	Tues.	7.00—9.30
*144A	Volumetric Analysis	Tues. and Wed.	7.00—9.30
**144B	Gravimetric Analysis	Tues. and Wed.	7.00—9.30
145	Organic Chemistry, Lectures	Wed.	7.00—8.15
145A	Organic Chemistry, Laboratory	Mon. and Tues.	7.00—9.30
146	Industrial Chemistry	Wed.	7.00—9.30
148	Technical Analysis	Tues.	7.00—9.30
149	Principles of Chemistry I	Wed.	8.15—9.30
149A	Principles of Chemistry II	Mon.	7.00—8.15
170	German I	Mon.	7.00—8.15
171	German II	Mon.	8.15—9.00

\* First term.

\*\* Second Term.

### Special Subjects

301	Advanced Mechanical Drawing and Orthographic Projections	Wed.	7.00—9.30
310	Architectural Drawing I	Mon. and Fri.	7.00—9.30
311	Architectural Drawing II	Mon. and Fri.	7.00—9.30
312	Architectural Drawing III	Mon. and Fri.	7.00—9.30
320	Freehand Drawing I	Tues. and Thurs.	7.00—9.30
321	Freehand Drawing II	Tues. and Thurs.	7.00—9.30
322	Industrial Design	Tues. and Thurs.	7.00—9.30
323	Life Class	Tues. and Thurs.	7.00—9.30

## RATES OF TUITION

### REGULAR COURSES

The tuition for the first year of all regular courses is thirty-five (35) dollars, payable as follows:

\$15.00 upon entering  
\$10.00 November 15  
\$10.00 January 15

The tuition for all years, but the first, of the regular courses shall be fifty (50) dollars, payable as follows:

\$20.00 upon entering  
\$15.00 November 15  
\$15.00 January 15

Beginning in September, 1919, all full Courses, now costing fifty dollars, will be advanced to fifty-five dollars for the year's tuition, this increased rate will not apply to students enrolled previous to September, 1917. The foregoing rates include membership in the Association.

### Individual Engineering Subjects

Course	Tuition	Course	Tuition
72 Advanced Structures	25.00	81 Materials of Construction	10.00
51 Advanced Surveying	15.00	10 Mathematics I	15.00
138 Alt. Cur. and Elec. Meas.		11 Mathematics II	15.00
Lectures	10.00	40 Mechanical Drawing	10.00
138A Alt. Curr. and Elec. Meas.		91 Mech. Eng. Drawing	20.00
Laboratory	10.00	90 Mechanism	20.00
139 Alt. Cur. Mach., Lec.	20.00	55 Municipal Eng. Probs.	20.00
139A Alt. Curr. Mach., Lab.	20.00	145 *Organic Chem., Lec.	24.00
30 Applied Mechanics I	15.00	145A *Organic Chem., Lab.	24.00
31 Applied Mechanics I A	10.00	96 Power Plant Design	18.00
95A Boilers and Prime Movers	25.00	20 Practical Physics	15.00
71 Bridge Design	25.00	149 Principles of Chem. I	20.00
80 Concrete Construction	25.00	149A Principles of Chem. II	20.00
122 Direct Cur. Mach., Lec.	15.00	142 *Qualitative Analysis, Lec.	22.00
124 Direct Cur. Mach., Lab.	15.00	142 *Qualitative Analysis, Lab.	22.00
126 Elements of Elec., Lec.	8.00	57 Railroad Engineering	15.00
127 Elements of Elec., Lab.	8.00	58 Railroad Eng. Drawing	20.00
21 Elements of Physics	15.00	59 Railroad Engineering and	
82 Foundations	10.00	Railroad Design	20.00
136 Generation, Transmission		33 Strength of Materials	25.00
and Utilization of Power	25.00	74 Structural Design	25.00
170 German I	10.00	73 Structural Drawing	20.00
171 German II	10.00	32 Structural Mechanics	25.00
144B *Gravimetric Analysis	25.00	50 Surveying and Plotting	25.00
56 Highway Engineering	10.00	143 *Technical Analysis	20.00
112 Hydraulic Engineering	15.00	70 Theory of Structures	25.00
146 *Industrial Chem.	20.00	95 Thermodynamics	15.00
140 *Inorganic Chem., Lec.	13.00	54 Topographical Drawing	10.00
141 *Inorganic Chem., Lab.	13.00	144A Volumetric Analysis	25.00
92 Machine Drawing	14.00		

\*Owing to the increased price of all materials used in the chemical laboratories, due to war conditions, a laboratory fee of four dollars will be charged to each student taking courses in the chemical laboratories. In addition, a laboratory deposit of four dollars will be required. This deposit is returnable upon payment of all breakage and other charges.

### Special Courses

301 Advanced Mech. Draw. &		320 Freehand Drawing I	10.00
Orthographic Proj'tions	\$10.00	321 Freehand Drawing II	10.00
310 Architectural Drawing I	10.00	322 Industrial Design	10.00
311 Architectural Drawing II	10.00	323 Life Class	20.00
312 Architectural Drawing III	10.00		

*Special Note.*—The above rates are in addition to membership (\$2). In case more than one subject is taken, a discount of \$3 for each additional subject will be made.



# General Departments

## Boston Young Men's Christian Association

### Department of Recreation and Health

ALBERT E. GARLAND, M.D., B.P.E., Director

This Department offers the *best recreation* that *re-creates*. Privileges as follows: Three Gymnasiums, Swimming Tank of Filtered Salt Water, Baths of all kinds, Classes to Music, Six Bowling Alleys, Tennis—Indoor and Out, Handball, Squash, Indoor Golf, Athletics—Indoor and Out, Basket-ball and Games, Boxing, Wrestling and Fencing. Best of Instruction. Medical Direction. Come in any time.

### Department of Religious Work

A. B. NICHOLLS, Secretary

In order that young men may secure a well-balanced development and attain the true foundation for successful living, the Association advises each member to so plan his schedule that he may enter into one or more of the following activities:

Character Building Classes	Training for Christian Service
Young Men's Sunday Forum	Lectures and "Talks"
Gospel Team	Workers' Library
Personal Interviews	Twenty-four-hour-a-day Club

### Department of Social Work

DAVID M. CLAGHORN, Director

The attention of members is called to the many opportunities in the Association for social service, and the following social features:

A Newly Equipped Game Room	El Club Sarmiento (Pan-American Club)
The Association Congress	The Camera Club
Popular Social Evenings	Concerts and Entertainments

### Department of Council and Placement

FREDERICK W. ROBINSON, Director

Advice given to young men concerning their vocational future and efforts made to place them in positions best adapted to their varied abilities. It also acts as a clearing house for young men seeking work and employers desiring to engage reliable help. Its service is not limited to members, but the latter are given liberal discounts and effort is made to notify them when good positions are open.

### Boys' Division

JAMES G. BARNES, S.B., City Boys' Work Secretary

The Boys' Division comprises boys from twelve to eighteen years of age, whose needs are studied and whose problems we try to solve. Activities are conducted along social, physical, educational, and spiritual lines. The annual membership fee is \$2.00; gymnasium and natatorium privileges are open to the boys at special rates.



UNIVERSITY OF ILLINOIS-URBANA



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**THE EVENING  
SCHOOL OF  
ENGINEERING**



FOUNDED FOR THE INSTRUCTION  
OF MEN IN THE THEORY AND  
PRACTICE OF ENGINEERING